

[74] WHAT IS CLAIMED IS:

1. A computer-implemented method for demanding a data link resource in a communications network, comprising:

calculating an unsatisfied demand (UD) value for the data link resource at a terminal;
and

transmitting the calculated UD value over the data link from the terminal to a base station at a time uncorrelated with a time at which new demand for the data link resource is detected by the terminal.

2. The method of claim 1, wherein the calculating step comprises calculating the UD value based on the following equation:

$$UD = NUM_RLC_BLK_UNSENT + NUM_RLC_BLK_NACK,$$

where NUM_RLC_BLK_UNSENT is a number of radio link control (RLC) blocks not yet sent and NUM_RLC_BLK_NACK is a number of RLC blocks negatively acknowledged by the base station.

3. The method of claim 2, wherein the calculating step comprises setting a UD_MAX value as a maximum UD value that can be conveyed by a UD field of a medium access control (MAC) header.

4. The method of claim 3, wherein the calculating step comprises setting the UD value to the UD_MAX value if the UD value is greater than the UD_MAX value.

5. The method of claim 2, wherein the transmitting step comprises transmitting the calculated UD value on every transmission from the terminal to the base station over the data link.

6. The method of claim 2, wherein the transmitting step comprises transmitting the calculated UD value on every transmission in which data is transmitted from the terminal to the base station over the data link.

7. A computer-implemented method for demanding a data link resource in a communications network, comprising:

calculating an unsatisfied demand (UD) value for the data link resource at a terminal,
based on the following equation:

$$UD = NUM_RLC_BLK_UNSENT + NUM_RLC_BLK_NACK,$$

where NUM_RLC_BLK_UNSENT is a number of radio link control (RLC) blocks not yet sent and NUM_RLC_BLK_NACK is a number of RLC blocks negatively acknowledged by a base station; and

transmitting the calculated UD value over the data link from the terminal to the base station.

8. The method of claim 7, wherein the transmitting step comprises transmitting the calculated UD value over the data link from the terminal to the base station at a time uncorrelated with a time at which new demand for the data link resource is detected by the terminal.

9. The method of claim 7, wherein the calculating step comprises setting a UD_MAX value as a maximum UD value that can be conveyed by a UD field of a medium access control (MAC) header.

10. The method of claim 9, wherein the calculating step comprises setting the UD value to the UD_MAX value if the UD value is greater than the UD_MAX value.

11. The method of claim 7, wherein the transmitting step comprises transmitting the calculated UD value on every transmission from the terminal to the base station over the data link.

12. The method of claim 7, wherein the transmitting step comprises transmitting the calculated UD value on every transmission in which data is transmitted from the terminal to the base station over the data link.

13. A computer-implemented method for interpreting a demand for a data link resource in a communications network, comprising:

calculating at a terminal an unsatisfied demand (UD) value for the data link resource based on the following equation:

$$UD = NUM_RLC_BLK_UNSENT + NUM_RLC_BLK_NACK,$$

where NUM_RLC_BLK_UNSENT is a number of radio link control (RLC) blocks not yet sent and NUM_RLC_BLK_NACK is a number of RLC blocks negatively acknowledged by a base station;

transmitting the calculated UD value over the data link from the terminal to the base station;

receiving the UD value for the data link resource from the terminal at the base station over the data link;

calculating an imputed unsatisfied demand (IUD) value at the base station based on the received UD value and existing data link resources already allocated to the terminal; and

transmitting the calculated IUD value to a data link resource scheduler.

14. The method of claim 13, further comprising initializing the IUD value to the UD value received when a new uplink flow over the data link is first established.

15. The method of claim 14, wherein the initializing step comprises servicing the new uplink flow in demand mode.

16. The method of claim 15, further comprising decrementing the IUD value whenever an uplink slot is allocated for the flow in the demand mode.

17. The method of claim 16, further comprising transitioning the demand mode to a polled mode when the IUD value is decremented to zero.

18. The method of claim 15, further comprising incrementing the IUD value whenever the UD value received indicates that the uplink flow requires resources of the data link that have not already been handled by previously allocated uplink slot assignments.

19. The method of claim 15, further comprising transitioning the flow from a polled mode to the demand mode when the IUD value is incremented to a value greater than zero.

20. The method of claim 19, further comprising servicing the flow in the demand mode.

21. The method of claim 13, wherein the step of calculating the IUD value comprises prospectively raising the IUD value at the base station based on a number of radio link control (RLC) blocks negatively acknowledged by the base station.

22. The method of claim 21, wherein the raising step comprises setting the IUD value at the base station to the number of the RLC blocks negatively acknowledged by the base station.

23. The method of claim 22, wherein the setting step comprises transitioning an uplink flow on the data link from a polled mode to a demand mode.

24. The method of claim 13, wherein the step of transmitting the calculated UD value comprises transmitting the calculated UD value over the data link from the terminal to the

base station at a time uncorrelated with a time at which new demand for the data link resource is detected by the terminal.

25. The method of claim 13, wherein the step of transmitting the calculated UD value comprises transmitting the calculated UD value on every transmission from the terminal to the base station over the data link.

26. The method of claim 13, wherein the step of transmitting the calculated UD value comprises transmitting the calculated UD value on every transmission in which data is transmitted from the terminal to the base station over the data link.

27. A computer-implemented method for performing bandwidth-on-demand signaling in a communications network, comprising:

calculating at a terminal an unsatisfied demand (UD) value for a data link resource based on the following equation:

$$UD = NUM_RLC_BLK_UNSENT + NUM_RLC_BLK_NACK,$$

where NUM_RLC_BLK_UNSENT is a number of radio link control (RLC) blocks not yet sent and NUM_RLC_BLK_NACK is a number of RLC blocks negatively acknowledged by a base station;

transmitting the calculated UD value over the data link from the terminal to the base station at a time uncorrelated with a time at which new demand for the data link resource is detected by the terminal;

receiving the UD value for the data link resource from the terminal at the base station over the data link;

calculating an imputed unsatisfied demand (IUD) value at the base station based on the received UD value and existing data link resources already allocated to the terminal; and

transmitting the calculated IUD value to a data link resource scheduler.

28. The method of claim 27, wherein the step of transmitting the calculated UD value comprises transmitting the calculated UD value on every transmission from the terminal to the base station over the data link.

29. The method of claim 27, wherein the step of transmitting the calculated UD value comprises transmitting the calculated UD value on every transmission in which data is transmitted from the terminal to the base station over the data link.

30. A computer-readable medium carrying one or more sequences of one or more instructions, the one or more sequences of one or more instructions including instructions which, when executed by one or more processors, cause the one or more processors to perform the steps recited in any one of claims 1-29.

31. A system configured to perform the steps recited in any one of claims 1-29.

32. An apparatus for demanding a data link resource in a communications network, comprising:

means for calculating an unsatisfied demand (UD) value for the data link resource;
and

means for transmitting the calculated UD value over the data link at a time uncorrelated with a time at which new demand for the data link resource is detected.

33. An apparatus for demanding a data link resource in a communications network, comprising:

means for calculating an unsatisfied demand (UD) value for the data link resource, based on the following equation:

$$UD = \text{NUM_RLC_BLK_UNSENT} + \text{NUM_RLC_BLK_NACK},$$

where NUM_RLC_BLK_UNSENT is a number of radio link control (RLC) blocks not yet sent and NUM_RLC_BLK_NACK is a number of RLC blocks negatively acknowledged; and

means for transmitting the calculated UD value over the data link.

34. A system for interpreting a demand for a data link resource in a communications network, comprising:

means for calculating at a terminal an unsatisfied demand (UD) value for the data link resource based on the following equation:

$$UD = \text{NUM_RLC_BLK_UNSENT} + \text{NUM_RLC_BLK_NACK},$$

where NUM_RLC_BLK_UNSENT is a number of radio link control (RLC) blocks not yet sent and NUM_RLC_BLK_NACK is a number of RLC blocks negatively acknowledged;

means for transmitting the calculated UD value over the data link;
means for receiving the UD value for the data link resource over the data link;
means for calculating an imputed unsatisfied demand (IUD) value based on the received UD value and existing data link resources already allocated; and
means for transmitting the calculated IUD value to a data link resource scheduling means.

35. A system for performing bandwidth-on-demand signaling in a communications network, comprising:

means for calculating an unsatisfied demand (UD) value for a data link resource based on the following equation:

$$UD = NUM_RLC_BLK_UNSENT + NUM_RLC_BLK_NACK,$$

where NUM_RLC_BLK_UNSENT is a number of radio link control (RLC) blocks not yet sent and NUM_RLC_BLK_NACK is a number of RLC blocks negatively acknowledged;

means for transmitting the calculated UD value over the data link at a time uncorrelated with a time at which new demand for the data link resource is detected;

means for receiving the UD value for the data link resource over the data link;

means for calculating an imputed unsatisfied demand (IUD) value based on the received UD value and existing data link resources already allocated; and

means for transmitting the calculated IUD value to a data link resource scheduling means.